National Institute of Environmental Health Sciences

How does climate change influence arctic mercury?

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Abstract:

Recent studies have shown that climate change is already having significant impacts on many aspects of transport pathways, speciation and cycling of mercury within Arctic ecosystems. For example, the extensive loss of sea-ice in the Arctic Ocean and the concurrent shift from greater proportions of perennial to annual types have been shown to promote changes in primary productivity, shift foodweb structures, alter mercury methylation and demethylation rates, and influence mercury distribution and transport across the ocean-sea-ice-atmosphere interface (bottom-up processes). In addition, changes in animal social behavior associated with changing sea-ice regimes can affect dietary exposure to mercury (top-down processes). In this review, we address these and other possible ramifications of climate variability on mercury cycling, processes and exposure by applying recent literature to the following nine questions; 1) What impact has climate change had on Arctic physical characteristics and processes? 2) How do rising temperatures affect atmospheric mercury chemistry? 3) Will a decrease in sea-ice coverage have an impact on the amount of atmospheric mercury deposited to or emitted from the Arctic Ocean, and if so, how? 4) Does climate affect air-surface mercury flux, and riverine mercury fluxes, in Arctic freshwater and terrestrial systems, and if so, how? 5) How does climate change affect mercury methylation/demethylation in different compartments in the Arctic Ocean and freshwater systems? 6) How will climate change alter the structure and dynamics of freshwater food webs, and thereby affect the bioaccumulation of mercury? 7) How will climate change alter the structure and dynamics of marine food webs, and thereby affect the bioaccumulation of marine mercury? 8) What are the likely mercury emissions from melting glaciers and thawing permafrost under climate change scenarios? and 9) What can be learned from current mass balance inventories of mercury in the Arctic? The review finishes with several conclusions and recommendations.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Extreme Weather Event, Food/Water Quality, Other Exposure

Extreme Weather Event: Wildfires

Food/Water Quality: Chemical

Geographic Feature:

resource focuses on specific type of geography

Arctic, Freshwater, Ocean/Coastal

Geographic Location:

resource focuses on specific location

Non-United States, United States

Non-United States: Asia, Europe

Asian Region/Country: Other Asian Region

Other Asian Region: Arctic

European Region/Country: European Region

Other European Region: Arctic

Health Impact:

specification of health effect or disease related to climate change exposure

Neurological Effect

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type:

format or standard characteristic of resource

Review

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content